A Message from the Editor

Welcome to the inaugural issue of the *International Journal of Approximate Reasoning* (*IJAR*)! I want to take a moment in this space to describe the journal, its scope, and its goals. A good way to start might be to discuss the title of this journal. According to Webster's, *reasoning* is "the drawing of inferences or conclusions from known or assumed facts." The term *approximate* indicates the presence of uncertainty. Uncertainties may arise in various ways—as measurement errors, as "noisy" and/or incomplete data, because a process is random, when the semantics of a natural language used to describe and define a process are ambiguous, and so on. Thus, *approximate reasoning* might be literally taken as the drawing of inferences or conclusions from known and unknown, or at least partially known, facts. *IJAR* will contain articles about this process.

How do we accomplish or facilitate approximate reasoning? And more importantly for readers of and contributors to *IJAR*, how can we attempt to have computer systems imitate this faculty for assimilation, integration, analysis, and exploitation of apparently incomplete and inconsistent information about processes under investigation? Initially, we propose systems of logic as formal models of reasoning that attempt to mimic the thinking process humans seem to use in arriving at solutions to (i.e., conclusions about) problems that are at once enormously complex and ill defined. Then we represent these models in computers and devise algorithms that manipulate the available information much as humans might. Humans are able to draw inferences and make decisions about processes in the absence of complete, consistent, and sufficient data and knowledge by using approximate reasoning; yet this reasoning is not well specified, formalized, or even identifiable by most of us.

Articles of interest to *IJAR* will include studies and formalisms that may eventually enable computers to assimilate, integrate, analyze, and exploit what appear to be the available relevant facts about a process, incomplete and uncertain as they may be, and subsequently to draw conclusions, or, perhaps less ambitiously, to supply, via a person-machine interface, estimates for the most likely conclusions. From these remarks one might infer that *IJAR* will provide a forum for researchers interested in modeling the human decision process on computers. It is currently fashionable to call such devices "intelligent systems." However, I would argue that we are a long way from building what most of us might be willing to call a truly intelligent machine; thus, *IJAR* will be content to discuss pieces of systems that mimic some facet of intelligent behavior. This latter aim evokes a somewhat broader interpretation of approximate reasoning than the definition advanced earlier. *IJAR* will certainly contain discussions of

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formal models based on any structure that appears meritorious; but further, we hope to stimulate discussions about real applications of these theories—that is, real components of possibly intelligent systems.

Models of approximate reasoning are many and diverse. One person may argue for stochastic formalisms such as Bayes's rule; models of inductive and deductive inference; reasoning by analogy; or monotonic, nonmonotonic, higher-order, and multiple-valued logics. Another might propose theories of evidence and belief, or fuzzy and commonsense reasoning. The list goes on and on. *IJAR* is an appropriate forum for theoretical considerations and practical applications of any model or structure that affects the way we represent and manipulate approximate or uncertain facts that bear on the process of imitating human reasoning. Beyond this, we encourage readers to consider *IJAR* an appropriate medium for discussions of applications in any area related to systems that ultimately provide either an alternative to or augmentative procedure for inference, decision, prediction, and control. As examples, *IJAR* will include articles on natural languages and interfaces, computer vision, expert systems, pattern recognition, robotics, information retrieval, engineering systems, database management, knowledge representation and engineering, and medical computing systems.

What types of articles are appropriate for *IJAR*? It is our intent to publish manuscripts in a variety of formats. Among these will be historical perspectives, state-of-the-art surveys, critical reviews and replies, regular research papers, short notes and communications, extended abstracts, comments on previous papers, letters to the editor, book reviews and responses, special issues elaborating a common theme, and, of course, the usual assortment of conference calendars, calls for papers, and the like. Interested writers are encouraged to consult the Information for Authors section of *IJAR* for details concerning submission of articles in any of these categories.

A glance at the contents of the first issue should convey the spirit in which *IJAR* is conceived. Hartzband, Holly, and Maryanski propose a data model that incorporates an inference structure based on analogical reasoning. Yager proposes quite a different approach; he presents a theory for reasoning based on possibility distributions that attempts to capture three types of canonical statements that reflect uncertainties in the knowledge base. Bonissone approaches reasoning under uncertainty by first postulating an axiomatic structure that any formalism should satisfy, and then proposing a new approach based on three layers of organization: representation, inference, and control. Another point of view on the management of uncertainty in the context of knowledge-based (production) systems is exemplified in the article by Cohen et al., who provide a description of a medical consultation system implemented as a general inference network and planner.

These four articles bear directly on methods and issues in approximate reasoning. The other articles in this issue reflect *IJAR*'s desire to publish

original work that collaterally affects the design of intelligent systems with reasoning capabilities. Kak's article on the Paninian approach to natural language manifests *IJAR*'s interest in issues surrounding the interface of humans and computers, whereas the article by Salah and Reilly reports on a method for reducing the number of rules needed in production systems through the use of a programmed management approach. Rounding out the first issue is a book review/response pair that concerns a text on fuzzy arithmetic written by Kaufmann and Gupta and reviewed by Eastman. We hope to balance the contents of most issues in this way, crossing from theory to practice and from one formalism to another.

Finally, a word about the relationship of *IJAR* and NAFIPS (the North American Fuzzy Information Processing Society). *IJAR* was originally conceived as a natural outgrowth of the *NAFIPS Newsletter* and will function as the official journal of NAFIPS in the sense that regular members of NAFIPS will receive *IJAR* automatically as part of their membership privileges. However, the contents of this inaugural issue accurately reflect both the bias of this editor and the stated desires of NAFIPS: that *IJAR* will welcome and actively seek and promote cross-fertilization of theories of approximate reasoning and their applications to intelligent systems through interactions of all segments of our professional community. Readers will thus find, in subsequent issues, articles representing diverse approaches to problems in the areas identified above. We also plan to have special issues guest-edited by investigators from various schools of thought. It is my intention to advertise through this journal any methodology that leads to better approximations of the processes we study. This, after all, is the scientific method!

To summarize, I hope these pages will serve as a lively and interesting forum for debate about and refinement, correction, and (when appropriate) rejection of methods and techniques advanced as a basis for the erection of truly "intelligent" person-machine systems. Please let me know what we can do to make this a more interesting and useful journal; I welcome your input and promise to accommodate your suggestions whenever possible.

Jim Bezdek